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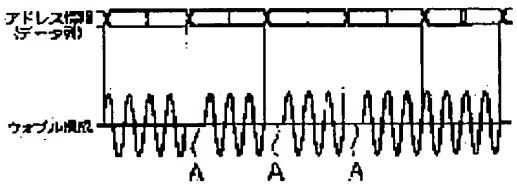
(54) OPTICAL DISK MEDIUM AND ITS ADDRESS DEMODULATION CIRCUIT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an optical disk medium capable of properly and remarkably simply superimposing address information on a guide groove and simply restoring the address information.
SOLUTION: In the optical disk medium that the guide groove for tracking is wobbled in the radial direction answering to the address information, the guide groove is constituted so as to be wobbled containing a part not being wobbled according to the data of the binary data line '0' '1' of the address information. For instance, in the area of the data '0', through all guide grooves are wobbled, in the area of the data '1', by being wobbled containing the part not being wobbled answering to the part A, the binary data line '0' '1' of the address information are discriminated clearly.



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CLAIMS

[Claim(s)]
[Claim 1] It is the optical disk medium characterized by carrying out wobbling of the aforementioned guide rail including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not carried out according to data in the optical disk medium by which wobbling of the guide rail for tracking is carried out to radial corresponding to address information.
[Claim 2] Wobbling of a guide rail, and the optical disk medium according to claim 1 characterized by forming the cos wave as a subcarrier.
[Claim 3] The 1-bit each data area of the binary data stream of address information is an optical disk medium according to claim 2 characterized by being formed by the length of the integral multiple period unit of a cos wave.
[Claim 4] It is the optical disk medium according to claim 1, 2, or 3 which wobbling of one inner data areas of all is carried out, and is characterized by carrying out wobbling of the data area of another side including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not carried out.
[Claim 5] The optical disk medium according to claim 4 characterized by being the length of the portion by which wobbling is not carried out, and the length of the integral multiple period unit of a cos wave.
[Claim 6] The optical disk medium according to claim 5 characterized by being the length of the integral multiple period unit of a cos wave, and the length of one period of a cos wave.
[Claim 7] The frequency of a subcarrier is an optical disk medium according to claim 2, 3, 4, 5, or 6 characterized by being set up between the frequency of a tracking-servo band, and the frequency of RF regenerative-signal band.
[Claim 8] The address demodulator circuit characterized by having the band pass filter which extracts the wobble signal component of a guide rail based on the tracking signal acquired from a claim 1 or the optical disk medium of any 1 publication of 7, and the wave detector which restores the binary data stream of address information according to the existence of the extracted wobble signal component.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention — CD-R (Compact Disc-Recordable), CD-RW (CD-Rewritable), and DVD (Digital Video Disc) etc. -- it is related with the optical disk medium in which a postscript or rewriting is possible, and its address demodulator circuit [like]
[0002]
[Description of the Prior Art] In recent years, an optical disk medium is developed as a mass record medium, and it is CD-DA (CD-Digital Audio) as the typical one. CD-ROM is put in practical use. CD-RW made flexibly rewritable [CD-R or the digital data whose postscript of digital data was enabled now although these were the record media only for reproduction which recorded the sound signal etc. as digital data] is put in practical use. Furthermore, a mass rewriting type optical disk medium like DVD is also put in practical use.
[0003] Since there is no EFM (Eight Fourteen Modulation) pit here in the state of un-recording unlike the case of the optical disk medium only for reproduction, it is necessary to enable it to specify the absolute address on a guide rail as it by a certain method in the added type of a postscript, or a rewritten type optical disk medium. the technique of making address information superimpose on the guide rail for the tracking minced by the disk (groove) as technique for this is proposed (for example, it has set in p28 grade in p54, and "practical use of the exclusive use IC in recordable compact disk system" the sharp technique No. 48 and March, 1991 in magazine "electronic technical" 1991-6 "the multimedia information system using rewritten type CD", and reference is made) As a method on which address information is made to superimpose, FM modulation (Frequency Modulation) is carried out to a guide rail based on address information, and a wobble signal is generated and it is made to carry out wobbling (meandering) of the guide rail to the disk radial based on this wobble signal.
[0004] This method is explained with reference to drawing 3 . Address information (address field information) consisted of a binary data stream by combination of "0" and "1", and once, after being changed into a biphase code, it is changed into the wobble signal by FM modulation. In this case, "0" of address information is changed into "0 or 0" data of a biphase code, and "1" of address information is changed into "1 or 0" data of a biphase code. and 22.05kHz**1kHz -- FM modulation -- following --" of a biphase code -- 0"21.05kHz -- it changes into the wobble signal of a subcarrier -- having --" of a biphase code -- 1"23.05kHz -- it is changed into the wobble signal of a subcarrier
[0005] "0" by which once carrying out the biphase coding of the address information in advance of FM modulation here is included in an address number, and "1" — it is for suppressing change of the probability of occurrence of data namely, the case of FM modulation -- "0" -- a data area and "1" -- since it differs so that the frequency of a subcarrier may be 21.05kHz and 23.05kHz in a data area — "0" — a data area and "1" — change of the probability of occurrence with a data area will also fluctuate the physical length for expressing a part for the single address That is, although the length (for example, sector unit etc.) in every block of record data is fixed, it will produce [changing the length of the wobble for / of "0" contained in the address number which shows the place, and "1" / expressing the address according to the probability of occurrence, and] conflict. Therefore, since [of "0" contained in an address number, and "1"] it is necessary to make the probability of occurrence regularity as much as possible, change of the probability of occurrence of "0" contained in address information and "1" has been suppressed by once changing address information into a biphase code.
[0006] In the optical disk unit using the optical disk medium which has the guide rail by which wobbling was carried out with such a wobble signal, although the guide rail was optically scanned by the optical pickup, since wobbling was carried out on the frequency to which a guide rail is much different from a tracking error, the tracking signal was superimposed on the tracking error signal and the ATIP (Absolute Time In Pregroove) wobble signal.
[0007] Then, the address demodulator circuit 1 of an optical disk unit is constituted by the band pass filter 2 and the frequency wave detector 3 as shown in drawing 4 . That is, a band pass filter 2 extracts an ATIP wobble signal (FM modulating signal) from the tracking signal acquired by the optical pickup. A biphase code will be restored if this extracted ATIP wobble signal is made binary by the threshold of 22.05kHz with the frequency wave detector 3. Then, according to a biphase decode rule, the decode of the address information of a field is carried out from this biphase code.
[0008]
[Problem(s) to be Solved by the Invention] However, when based on the wobbling method of such a

conventional guide rail, and an address recovery method, biphase coding and the decode processing from a biphase code are required, and it is very complicated. moreover -- even if it performs biphase coding processing -- not necessarily -- "0" and "1" -- change of the probability of occurrence of data may necessarily become that there is nothing, and may produce change to the physical length of an address field
[0009] Then, this invention is simplified extremely, can make address information superimpose on a guide rail proper, and aims at offering the optical disk medium which can restore the address information easily further, and its address demodulator circuit.
[0010]
[Means for Solving the Problem] In the optical disk medium by which, as for the optical disk medium according to claim 1, wobbling of the guide rail for tracking is carried out to radial corresponding to address information, wobbling of the aforementioned guide rail is carried out including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not carried out according to data. Therefore, the binary data stream of address information can be made to superimpose on a guide rail by wobbling very simply and proper, without not expressing address information on two different frequency like FM modulation technique, and producing a difference to the length of a 1-bit data area, since how the portion by which wobbling is not carried out is contained can distinguish and express the binary data stream "0" of address information, and "1."
[0011] Invention according to claim 2 is formed considering wobbling of the guide rail in an optical disk medium according to claim 1, and the cos wave as a subcarrier. Therefore, it is the most general. The guide rail by which wobbling was carried out can be continuously formed in the bottom of the subcarrier by cos wave expression without way piece ******. It is cos wave expression here. There is no difference substantial also as sin wave expression, and it is equivalent.
[0012] Invention according to claim 3 is formed by the 1-bit each data area of the binary data stream of the address information in an optical disk medium according to claim 2, and the length of the integral multiple period unit of a cos wave. Therefore, since the duty ratio of the wobble signal in the guide rail by which wobbling was carried out becomes always fixed, recovery processing of the address information from a wobble signal becomes very easy. It is plurality also to the PLL circuit for combining and taking such a wobble signal and a synchronization. Since the number of times which the cos wave component is contained and compares a phase increases, it is easier to take a synchronization and it becomes easy to also process a control system.
[0013] In the optical disk medium according to claim 1, 2, or 3, wobbling of one inner data areas of all is carried out, and wobbling of the invention according to claim 4 is carried out including the portions of the binary data stream "0" of address information, and "1" to which wobbling of the data area of another side is not carried out. Therefore, by the existence of wobbling, the binary data stream "0" of address information and "1" can be expressed easily, and the recovery can also perform them easily and correctly.
[0014] Invention according to claim 5 is the length of the portion by which wobbling is not carried out, and the length of the integral multiple period unit of a cos wave in an optical disk medium according to claim 4. Therefore, since the duty ratio of a wobble signal becomes always fixed in case the existence of wobbling expresses simply the binary data stream "0" of address information, and "1", recovery processing of the address information from a wobble signal becomes very easy.
[0015] invention according to claim 6 is set to an optical disk medium according to claim 5 -- they are the length of the integral multiple period unit of a cos wave, and the length of one period of a cos wave Therefore, since the rate for which the field which does not carry out wobbling accounts is suppressed to necessary minimum, even if the portion by which wobbling is not carried out is contained, a bad influence is not done to the PLL circuit for taking a wobble signal and a synchronization etc.
[0016] In the optical disk medium according to claim 2, 3, 4, 5, or 6, the frequency of a subcarrier is set up for invention according to claim 7 between the frequency of a tracking-servo band, and the frequency of RF regenerative-signal band. Therefore, the frequency to which wobbling of the guide rail is carried out has a bad influence neither on a tracking-servo system nor RF reversion system.
[0017] The address demodulator circuit of invention according to claim 8 is equipped with the band pass filter which extracts the wobble signal component of a guide rail based on the tracking signal acquired from a claim 1 or the optical disk medium of any 1 publication of 7, and the wave detector which restores the binary data stream of address information according to the existence of the extracted wobble signal component. Therefore, that what is necessary is to extract how the portion by which wobbling is not carried out is contained, and just to restore the binary data stream of address information, once it extracts a biphase code, complicated processing which performs transform processing and is restored is not required, but it ends with easy circuitry.
[0018]
[Embodiments of the Invention] The gestalt of 1 operation of this invention is explained based on drawing 1 and drawing 2 . With the gestalt of this operation, although especially the optical disk medium itself does not illustrate, it is various added types of a postscript, such as CD-R, CD-RW, and DVD, or a rewritten type optical disk medium, and is applied to that by which wobbling of the guide rail (groove) minced by the disk for tracking is beforehand carried out to radial corresponding to address information. Here, especially with the gestalt of this operation, wobbling of the guide rail to which address information was made to correspond carries out here, and it has the feature in a way. That is, with the gestalt of this operation, different data are expressed by including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not partially carried out according to data, without always carrying out wobbling, in case the disk

radial is made to move in a zigzag direction, the guide rail minced by the disk is formed as a wobble slot and address information is made to superimpose on the wobble slot.
[0019] First, it is a subcarrier at the time of carrying out wobbling of the guide rail. A cos wave is used, and it is set up so that the guide rail by which wobbling was carried out may continue without way piece ****** fundamentally. It is set as the length of a unit by four periods here the integral multiple period unit for one period of like and a cos wave of the binary data stream "0" of address information, and "1" which shows a 1-bit each data area to drawing 1 , and here. Since the duty ratio of a wobble signal becomes always fixed and it is not influenced of dc-component change by such setup, the demodulator circuit of the address information mentioned later can be realized with easy composition. Simultaneously, although not illustrated especially, the number of times of direction with to some extent many waves (cos wave) of a wobble of a phase comparison increases, and it becomes easy to take a synchronization for the PLL circuit for taking a wobble signal and a synchronization.
[0020] And as the binary data stream and wobble composition of address information are shown in drawing 1 by comparison about actual wobbling It is formed as a wobble slot of one data "0" of the binary data stream "0" of address information, and "1" which always carried out wobbling of the guide rail to the disk radial in the field. In the field of the data "1" of another side It is formed the integral multiple period for one period of a cos wave, and here as a wobble slot which included as a portion A to which wobbling of one period is not carried out, and carried out wobbling to the disk radial in the remaining portion. Therefore, in the case of the gestalt of this operation, data "0" are in a field. It is formed as a guide rail to which wobbling of four periods of a cos wave was carried out, and is a head in the field of data "1". Three periods of a cos wave are formed after owner Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. as a guide rail by which wobbling was carried out in the portion by which wobbling is not carried out by one period of a cos wave. Portion which is not made to carry out wobbling here with the gestalt of this operation Since it fixes as one period of a cos wave, change is not brought to the duty ratio of a wobble signal and the demodulator-circuit system of address information is not affected. Moreover, portion which does not carry out wobbling, for example Although it is a reason good also as two periods of a cos wave, with the gestalt of this operation, it is the minimum. Since the portion which cannot take a synchronization in the PLL circuit for taking a wobble signal and a synchronization since it is considering as one period of a cos wave serves as the minimum, a synchronization takes and it can maintain also easy.
[0021] The example of composition of the demodulator circuit 4 of address information established into the optical disk unit using the above optical disk media in the gestalt of this operation to drawing 2 is shown. This demodulator circuit 4 is constituted by the band pass filter 5 and the wave detector 6. The tracking signal acquired from an optical disk medium is inputted into a band pass filter 5. The wobble signal component corresponding to a cos wave is extracted. The extracted wobble signal component will be inputted into a wave detector 6, the existence of the wobble signal will be detected, and the binary data stream of address information will be restored according to the existence. if it is the case of the gestalt of this operation for example, — from the field for four periods of a cos wave if the wobble signal for four periods of a cos wave is detected, it will be recognized as it being the field of the data "0" in the binary data stream "0" of address information, and "1" — from the field for four periods of a cos wave If the wobble signal for three periods of a cos wave is detected, it will be recognized as it That is, depending on how the portion by which wobbling is not carried out is contained, it can distinguish [of the binary data stream "0" of address information, and "1"] clearly whether it is which field, and the recovery of address information becomes easy and exact about it.
[0022] As the subcarrier for carrying out wobbling of the guide rail of an optical disk medium in the relation between the frequency of these tracking-servo bands, and the frequency of RF regenerative-signal band, although TORAKINGU servo system and RF reversion system are naturally contained in this optical disk unit here The frequency of a cos wave is set as the frequency which has **ed between the frequency of a tracking-servo band, and the frequency of RF regenerative-signal band. Therefore, the frequency to which wobbling of the guide rail is carried out has a bad influence neither on a tracking-servo system nor RF reversion system.
[0023] In addition, although the portion of data "1" which does not carry out wobbling is assigned to the head portion of a field with the gestalt of this operation, you may not be a head portion as long as data "1" are in a field.
[0024] Moreover, although wobbling of all is carried out and the portion of data "1" which does not carry out wobbling is included in the field side in the field side of data "0" with the gestalt of this operation, conversely, the portion of data "0" which does not carry out wobbling is included, and it may be made to carry out wobbling of all, and to carry out wobbling to a field side in the field side of data "1." What is necessary is in short, to set it as either beforehand and just to unify into it as specification of the optical disk medium concerned.
[0025]
[Effect of the Invention] In the optical disk medium by which wobbling of the guide rail for tracking is carried out to radial corresponding to address information according to the optical disk medium of invention according to claim 1 Since wobbling of the guide rail is carried out including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not carried out according to data How the portion by which wobbling is not carried out is contained can distinguish and express the binary data stream "0" of address information, and "1." The binary data stream of address information can be made to superimpose on a guide rail by wobbling very simply and proper, without not expressing address information

on two different frequency like FM modulation technique, and producing a difference to the length of a 1-bit data area.
[0026] According to invention according to claim 2, since wobbling of the guide rail in an optical disk medium according to claim 1 is formed considering the cos wave as a subcarrier, it is the most common. The guide rail by which wobbling was carried out can be continuously formed in the bottom of the subcarrier by cos wave expression without way piece ******.
[0027] According to invention according to claim 3, since the 1-bit each data area of the binary data stream of the address information in an optical disk medium according to claim 2 is formed by the length of the integral multiple period unit of a cos wave The duty ratio of the wobble signal in the guide rail by which wobbling was carried out can always be made regularity. Recovery processing of the address information from a wobble signal can be made very easy. It is plurality also to the PLL circuit for combining and taking such a wobble signal and a synchronization. A synchronization can also be made easier to take, since the number of times which compares a phase by including a cos wave component increases.
[0028] According to invention according to claim 4, in an optical disk medium according to claim 1, 2, or 3, since wobbling of one inner data areas of all is carried out and wobbling of the data area of another side is carried out including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not carried out, the binary data stream "0" of address information and "1" can be expressed easily, and the recovery can also perform them easily and correctly by the existence of wobbling.
[0029] Since the length of the portion by which wobbling is not carried out is made into the length of the integral multiple period unit of a cos wave in the optical disk medium according to claim 4 according to invention according to claim 5 In case the existence of wobbling expresses simply the binary data stream "0" of address information, and "1", the duty ratio of a wobble signal can always be maintained uniformly, and let recovery processing of the address information from a wobble signal be a very easy thing.
[0030] according to invention according to claim 6, it sets to an optical disk medium according to claim 5 — since the length of the integral multiple period unit of a cos wave is suppressing the rate for which considers as the length of one period of a cos wave, and the field which does not carry out wobbling accounts to necessary minimum, even if the portion by which wobbling is not carried out is contained, the bad influence to the PLL circuit for taking a wobble signal and a synchronization etc. is avoidable
[0031] According to invention according to claim 7, in an optical disk medium according to claim 2, 3, 4, 5, or 6, since the frequency of a subcarrier is set up between the frequency of a tracking-servo band, and the frequency of RF regenerative-signal band, it is avoidable that the frequency to which wobbling of the guide rail is carried out has a bad influence on a tracking-servo system or RF reversion system.
[0032] The band pass filter which extracts the wobble signal component of a guide rail based on the tracking signal acquired from a claim 1 or the optical disk medium of any 1 publication of 7 according to the address demodulator circuit of invention according to claim 8, Since it has the wave detector which restores the binary data stream of address information according to the existence of the extracted wobble signal component That what is necessary is to extract how the portion by which wobbling is not carried out is contained, and just to restore the binary data stream of address information, once it extracts a biphase code, complicated processing which performs transform processing and is restored cannot be required, but easy circuitry can be managed.

[Translation done.]

TECHNICAL FIELD

[The technical field to which invention belongs] this invention — CD-R (Compact Disc-Recordable), CD-RW (CD-Rewritable), and DVD (Digital Video Disc) etc. — it is related with the optical disk medium in which a postscript or rewriting is possible, and its address demodulator circuit [like]

[Translation done.]

PRIOR ART

[Description of the Prior Art] In recent years, an optical disk medium is developed as a mass record medium, and it is CD-DA (CD-Digital Audio) as the typical one. CD-ROM is put in practical use. CD-RW made flexibly rewritable [CD-R or the digital data whose postscript of digital data was enabled now although these were the record media only for reproduction which recorded the sound signal etc. as digital data] is put in practical use. Furthermore, a mass rewriting type optical disk medium like DVD is also put in practical use.

[0003] Since there is no EFM (Eight Fourteen Modulation) pit here in the state of un-recording unlike the case of the optical disk medium only for reproduction, it is necessary to enable it to specify the absolute address on a guide rail as it by a certain method in the added type of a postscript, or a rewritten type optical disk medium. The technique of making address information superimpose on the guide rail for the tracking minced by the disk (groove) as technique for this is proposed (for example, magazine.).

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to the optical disk medium of invention according to claim 1, the guide rail for tracking corresponds to address information. In the optical disk medium by which wobbling is carried out to radial, since wobbling of the guide rail is carried out including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not carried out according to data How the portion by which wobbling is not carried out is contained can distinguish and express the binary data stream "0" of address information, and "1." The binary data stream of address information can be made to superimpose on a guide rail by wobbling very simply and proper, without not expressing address information on two different frequency like FM modulation technique, and producing a difference to the length of a 1-bit data area.
[0026] According to invention according to claim 2, since wobbling of the guide rail in an optical disk medium according to claim 1 is formed considering the cos wave as a subcarrier, it is the most common. The guide rail by which wobbling was carried out can be continuously formed in the bottom of the subcarrier by cos wave expression without way piece ******.
[0027] By invention according to claim 3, the 1-bit each data area of the binary data stream of the address information in an optical disk medium according to claim 2 is formed by the length of the integral multiple period unit of a cos wave. Therefore, it is plurality also to the PLL circuit for always being able to make regularity the duty ratio of the wobble signal in the guide rail by which wobbling was carried out, being able to make very easy recovery processing of the address information from a wobble signal, combining, and taking such a wobble signal and a synchronization. A synchronization can also be made easier to take, since the number of times which compares a phase by including a cos wave component increases.
[0028] In invention according to claim 4, in the optical disk medium according to claim 1, 2, or 3, wobbling of one inner data areas of all is carried out, and wobbling of the data area of another side is carried out including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not carried out. Therefore, by the existence of wobbling, the binary data stream "0" of address information and "1" can be expressed easily, and the recovery can also perform them easily and correctly.
[0029] Let the length of the portion by which wobbling is not carried out be the length of the integral multiple period unit of a cos wave in the optical disk medium according to claim 4 in invention according to claim 5. Therefore, in case the existence of wobbling expresses simply the binary data stream "0" of address information, and "1", the duty ratio of a wobble signal can always be maintained uniformly, and let recovery processing of the address information from a wobble signal be a very easy thing.
[0030] according to invention according to claim 6, it sets to an optical disk medium according to claim 5 — since the length of the integral multiple period unit of a cos wave is suppressing the rate for which considers as the length of one period of a cos wave, and the field which does not carry out wobbling accounts to necessary minimum, even if the portion by which wobbling is not carried out is contained, the bad influence to the PLL circuit for taking a wobble signal and a synchronization etc. is avoidable
[0031] According to invention according to claim 7, in an optical disk medium according to claim 2, 3, 4, 5, or 6, since the frequency of a subcarrier is set up between the frequency of a tracking-servo band, and the frequency of RF regenerative-signal band, it is avoidable that the frequency to which wobbling of the guide rail is carried out has a bad influence on a tracking-servo system or RF reversion system.
[0032] The band pass filter which extracts the wobble signal component of a guide rail based on the tracking signal acquired from a claim 1 or the optical disk medium of any 1 publication of 7 according to the address demodulator circuit of invention according to claim 8, Since it has the wave detector which restores the binary data stream of address information according to the existence of the extracted wobble signal component, that what is necessary is to extract how the portion by which wobbling is not carried out is contained, and just to restore the binary data stream of address information, once it extracts a biphase code, complicated processing which performs transform processing and is restored cannot be required, but easy circuitry can be managed.

[Translation done.]

* NOTICES *

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, when based on the wobbling method of such a conventional guide rail, and an address recovery method, biphase coding and the decode processing from a biphase code are required, and it is very complicated. moreover -- even if it performs biphase coding processing -- not necessarily -- "0" and "1" -- change of the probability of occurrence of data may necessarily become that there is nothing, and may produce change to the physical length of an address field [0009] Then, this invention is simplified extremely, can make address information superimpose on a guide rail proper, and aims at offering the optical disk medium which can restore the address information easily further, and its address demodulator circuit.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] In the optical disk medium by which, as for the optical disk medium according to claim 1, wobbling of the guide rail for tracking is carried out to radial corresponding to address information, wobbling of the aforementioned guide rail is carried out including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not carried out according to data. Therefore, the binary data stream of address information can be made to superimpose on a guide rail by wobbling very simply and proper, without not expressing address information on two different frequency like FM modulation technique, and producing a difference to the length of a 1-bit data area, since how the portion by which wobbling is not carried out is contained can distinguish and express the binary data stream "0" of address information, and "1."

[0011] Invention according to claim 2 is formed considering wobbling of the guide rail in an optical disk medium according to claim 1, and the cos wave as a subcarrier. Therefore, it is the most general. The guide rail by which wobbling was carried out can be continuously formed in the bottom of the subcarrier by cos wave expression without way piece ******. It is cos wave expression here. There is no difference substantial also as sin wave expression, and it is equivalent.

[0012] Invention according to claim 3 is formed by the 1-bit each data area of the binary data stream of the address information in an optical disk medium according to claim 2, and the length of the integral multiple period unit of a cos wave. Therefore, since the duty ratio of the wobble signal in the guide rail by which wobbling was carried out becomes always fixed, recovery processing of the address information from a wobble signal becomes very easy. It is plurality also to the PLL circuit for combining and taking such a wobble signal and a synchronization. Since the number of times which the cos wave component is contained and compares a phase increases, it is easier to take a synchronization and it becomes easy to also process a control system.

[0013] In the optical disk medium according to claim 1, 2, or 3, wobbling of one inner data areas of all is carried out, and wobbling of the invention according to claim 4 is carried out including the portions of the binary data stream "0" of address information, and "1" to which wobbling of the data area of another side is not carried out. Therefore, by the existence of wobbling, the binary data stream "0" of address information and "1" can be expressed easily, and the recovery can also perform them easily and correctly.

[0014] Invention according to claim 5 is the length of the portion by which wobbling is not carried out, and the length of the integral multiple period unit of a cos wave in an optical disk medium according to claim 4. Therefore, since the duty ratio of a wobble signal becomes always fixed in case the existence of wobbling expresses simply the binary data stream "0" of address information, and "1", recovery processing of the address information from a wobble signal becomes very easy.

[0015] invention according to claim 6 is set to an optical disk medium according to claim 5 -- they are the length of the integral multiple period unit of a cos wave, and the length of one period of a cos wave Therefore, since the rate for which the field which does not carry out wobbling accounts is suppressed to necessary minimum, even if the portion by which wobbling is not carried out is contained, a bad influence is not done to the PLL circuit for taking a wobble signal and a synchronization etc.

[0016] In the optical disk medium according to claim 2, 3, 4, 5, or 6, the frequency of a subcarrier is set up for invention according to claim 7 between the frequency of a tracking-servo band, and the frequency of RF regenerative-signal band. Therefore, the frequency to which wobbling of the guide rail is carried out has a bad influence neither on a tracking-servo system nor RF reversion system.

[0017] The address demodulator circuit of invention according to claim 8 is equipped with the band pass filter which extracts the wobble signal component of a guide rail based on the tracking signal acquired from a claim 1 or the optical disk medium of any 1 publication of 7, and the wave detector which restores the binary data stream of address information according to the existence of the extracted wobble signal component. Therefore, that what is necessary is to extract how the portion by which wobbling is not carried out is contained, and just to restore the binary data stream of address information, once it extracts a biphase code, complicated processing which performs transform processing and is restored is not required, but it ends with easy circuitry.

[0018]

[Embodiments of the Invention] The gestalt of 1 operation of this invention is explained based on drawing 1 and drawing 2 . With the gestalt of this operation, although especially the optical disk medium itself does not illustrate, it is various added types of a postscript, such as CD-R, CD-RW, and DVD, or a rewritten type optical disk medium, and is applied to that by which wobbling of the guide rail (groove) minced by the disk for tracking is beforehand carried out to radial corresponding to address information. Here, especially with the

gestalt of this operation, wobbling of the guide rail to which address information was made to correspond carries out here, and it has the feature in a way. That is, with the gestalt of this operation, different data are expressed by including the portions of the binary data stream "0" of address information, and "1" by which wobbling is not partially carried out according to data, without always carrying out wobbling, in case the disk radial is made to move in a zigzag direction, the guide rail minced by the disk is formed as a wobble slot and address information is made to superimpose on the wobble slot.

[0019] First, it is a subcarrier at the time of carrying out wobbling of the guide rail. A cos wave is used, and it is set up so that the guide rail by which wobbling was carried out may continue without way piece ****** fundamentally. It is set as the length of a unit by four periods here the integral multiple period unit for one period of like and a cos wave of the binary data stream "0" of address information, and "1" which shows a 1-bit each data area to drawing 1 , and here. Since the duty ratio of a wobble signal becomes always fixed and it is not influenced of dc-component change by such setup, the demodulator circuit of the address information mentioned later can be realized with easy composition. Simultaneously, although not illustrated especially, the number of times of direction with to some extent many waves (cos wave) of a wobble of a phase comparison increases, and it becomes easy to take a synchronization for the PLL circuit for taking a wobble signal and a synchronization.

[0020] And as the binary data stream and wobble composition of address information are shown in drawing 1 by comparison about actual wobbling It is formed as a wobble slot of one data "0" of the binary data stream "0" of address information, and "1" which always carried out wobbling of the guide rail to the disk radial in the field. In the field of the data "1" of another side It is formed the integral multiple period for one period of a cos wave, and here as a wobble slot which included as a portion A to which wobbling of one period is not carried out, and carried out wobbling to the disk radial in the remaining portion. Therefore, in the case of the gestalt of this operation, data "0" are in a field. It is formed as a guide rail to which wobbling of four periods of a cos wave was carried out, and is a head in the field of data "1". Three periods of a cos wave are formed after owner Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. as a guide rail by which wobbling was carried out in the portion by which wobbling is not carried out by one period of a cos wave. Portion which is not made to carry out wobbling here with the gestalt of this operation Since it fixes as one period of a cos wave, change is not brought to the duty ratio of a wobble signal and the demodulator-circuit system of address information is not affected. Moreover, portion which does not carry out wobbling, for example Although it is a reason good also as two periods of a cos wave, with the gestalt of this operation, it is the minimum. Since the portion which cannot take a synchronization in the PLL circuit for taking a wobble signal and a synchronization since it is considering as one period of a cos wave serves as the minimum, a synchronization takes and it can maintain also easy.

[0021] The example of composition of the demodulator circuit 4 of address information established into the optical disk unit using the above optical disk media in the gestalt of this operation to drawing 2 is shown. This demodulator circuit 4 is constituted by the band pass filter 5 and the wave detector 6. The tracking signal acquired from an optical disk medium is inputted into a band pass filter 5. The wobble signal component corresponding to a cos wave is extracted. The extracted wobble signal component will be inputted into a wave detector 6, the existence of the wobble signal will be detected, and the binary data stream of address information will be restored according to the existence. if it is the case of the gestalt of this operation for example, — from the field for four periods of a cos wave if the wobble signal for four periods of a cos wave is detected, it will be recognized as it being the field of the data "0" in the binary data stream "0" of address information, and "1" — from the field for four periods of a cos wave If the wobble signal for three periods of a cos wave is detected, it will be recognized as it That is, depending on how the portion by which wobbling is not carried out is contained, it can distinguish [of the binary data stream "0" of address information, and "1"] clearly whether it is which field, and the recovery of address information becomes easy and exact about it.

[0022] As the subcarrier for carrying out wobbling of the guide rail of an optical disk medium in the relation between the frequency of these tracking-servo bands, and the frequency of RF regenerative-signal band, although TORAKINGU servo system and RF reversion system are naturally contained in this optical disk unit here The frequency of a cos wave is set as the frequency which has **ed between the frequency of a tracking-servo band, and the frequency of RF regenerative-signal band. Therefore, the frequency to which wobbling of the guide rail is carried out has a bad influence neither on a tracking-servo system nor RF reversion system.

[0023] In addition, although the portion of data "1" which does not carry out wobbling is assigned to the head portion of a field with the gestalt of this operation, you may not be a head portion as long as data "1" are in a field.

[0024] Moreover, although wobbling of all is carried out and the portion of data "1" which does not carry out wobbling is included in the field side in the field side of data "0" with the gestalt of this operation, conversely, the portion of data "0" which does not carry out wobbling is included, and it may be made to carry out wobbling of all, and to carry out wobbling to a field side in the field side of data "1." What is necessary is in short, to set it as either beforehand and just to unify into it as specification of the optical disk medium concerned.

[Translation done.]

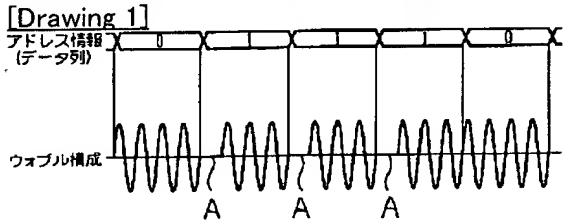
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is explanatory drawing showing the relation of the binary data stream of the address information of the form of 1 operation and wobble composition of this invention.
[Drawing 2] It is the block diagram showing the demodulator circuit of address information.
[Drawing 3] It is explanatory drawing showing the conventional FM modulation technique.
[Drawing 4] It is the block diagram showing the demodulator circuit of address information.
[Description of Notations]
5 Band Pass Filter
6 Wave Detector

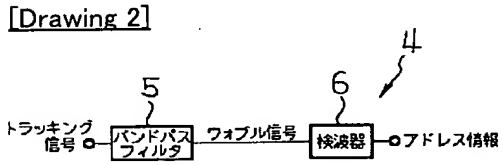
[Translation done.]

DRAWINGS

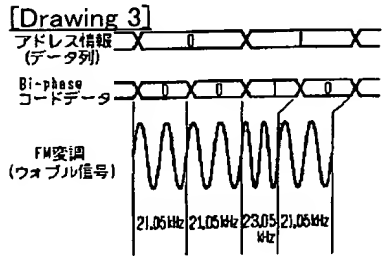
[Drawing 1]



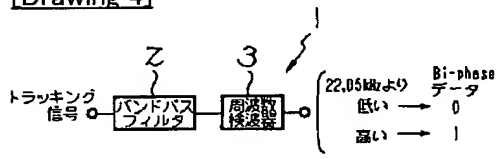
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]

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	7/00			7/00	Ｒ
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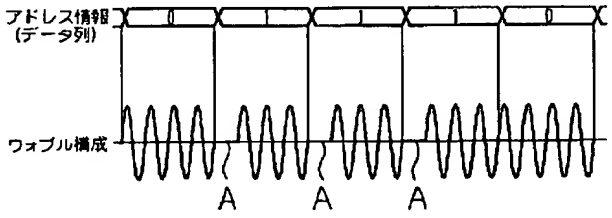
(54)【発明の名称】　光ディスク媒体及びそのアドレス復調回路

(57)【要約】

【課題】　極めて簡単にしてアドレス情報を案内溝に適正に重畳でき、かつ、そのアドレス情報の復元を簡単に行える光ディスク媒体を提供する。

【解決手段】　トラッキングのための案内溝がアドレス情報に対応して半径方向にウォブリングされている光ディスク媒体において、案内溝はアドレス情報の２値データ列“０”“１”のデータに応じてウォブリングされていない部分を含んでウォブリングされるようにした。例えば、データ“０”の領域では全てウォブリングさせるが、データ“１”の領域では部分Ａに対応させてウォブリングさせない部分を含んでウォブリングさせることにより、ウォブリングされていない部分の含まれ方により、アドレス情報の２値データ列“０”“１”の区別が明確になるようにした。



1

【特許請求の範囲】

【請求項１】　トラッキングのための案内溝がアドレス情報に対応して半径方向にウォブリングされている光ディスク媒体において、前記案内溝はアドレス情報の２値データ列“０”“１”のデータに応じてウォブリングされていない部分を含んでウォブリングされていることを特徴とする光ディスク媒体。

【請求項２】　案内溝のウォブリングは、cos波を搬送波として形成されていることを特徴とする請求項１記載の光ディスク媒体。

【請求項３】　アドレス情報の２値データ列の各１ビットデータ領域は、
cos波の整数倍周期単位の長さで形成されていることを特徴とする請求項２記載の光ディスク媒体。

【請求項４】　アドレス情報の２値データ列“０”“１”の内の一方のデータ領域は全てウォブリングされ他方のデータ領域はウォブリングされていない部分を含んでウォブリングされていることを特徴とする請求項１，２又は３記載の光ディスク媒体。

【請求項５】　ウォブリングされていない部分の長さは、cos波の整数倍周期単位の長さであることを特徴とする請求項４記載の光ディスク媒体。

【請求項６】　cos波の整数倍周期単位の長さは、cos波の１周期の長さであることを特徴とする請求項５記載の光ディスク媒体。

【請求項７】　搬送波の周波数は、トラッキングサーボ帯域の周波数とＲＦ再生信号帯域の周波数との間に設定されていることを特徴とする請求項２，３，４，５又は６記載の光ディスク媒体。

【請求項８】　請求項１ないし７の何れか一記載の光ディスク媒体から得られるトラッキング信号に基づき案内溝のウォブル信号成分を抽出するバンドパスフィルタと、抽出されたウォブル信号成分の有無に応じてアドレス情報の２値データ列を復元する検波器と、を備えることを特徴とするアドレス復調回路。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ＣＤ－Ｒ（Compact Disc－Recordable），ＣＤ－ＲＷ（ＣＤ－Rewritable）やＤＶＤ（Digital Video Disc）等のような追記或いは書換え可能な光ディスク媒体及びそのアドレス復調回路に関する。

【０００２】

【従来の技術】近年、大容量の記録媒体として光ディスク媒体が開発され、その代表的な一つとしてＣＤ－ＤＡ（ＣＤ－Digital Audio）やＣＤ－ＲＯＭが実用化されている。これらは音声信号等をデジタルデータとして記録した再生専用の記録媒体であるが、現在では、デジタルデータを追記可能としたＣＤ－Ｒやデジタルデータを書換自在としたＣＤ－ＲＷ等も実用化されている。さ

2

らには、ＤＶＤのような大容量の書換え型の光ディスク媒体も実用化されている。

【０００３】ここに、追記型或いは書換え型の光ディスク媒体においては、再生専用の光ディスク媒体の場合と異なり、未記録状態ではＥＦＭ（Eight Fourteen Modulation）ピットがないため、何らかの方法で案内溝上の絶対アドレスを特定できるようにする必要がある。このための手法として、ディスクに刻まれるトラッキングのための案内溝（グルーブ）にアドレス情報を重畳させる手法が提案されている（例えば、雑誌「電子技術」１９９１－６中の「追記型ＣＤシステムにおける専用ＩＣの活用」ｐ５４や、シャープ技法第４８号・１９９１年３月「書き換え型ＣＤを用いたマルチメディア情報システム」中のｐ２８等において言及されている）。案内溝にアドレス情報を重畳させる方法として、アドレス情報に基づきＦＭ変調（Frequency Modulation）させてウォブル信号を生成し、このウォブル信号に基づき案内溝をディスク半径方向にウォブリング（蛇行）させるようにしている。

【０００４】この方式を図３を参照して説明する。アドレス情報（アドレス原情報）は“０”“１”の組合せによる２値データ列からなり、一旦、バイフェーズコードに変換されてから、ＦＭ変調によりウォブル信号に変換している。この場合、アドレス情報の“０”はバイフェーズコードの“０，０”のデータに変換され、アドレス情報の“１”はバイフェーズコードの“１，０”のデータに変換される。そして、２２．０５ｋＨｚ±１ｋＨｚなるＦＭ変調に従い、バイフェーズコードの“０”は２１．０５ｋＨｚなる搬送波のウォブル信号に変換され、バイフェーズコードの“１”は２３．０５ｋＨｚなる搬送波のウォブル信号に変換される。

【０００５】ここに、ＦＭ変調に先立ち、アドレス情報を一旦バイフェーズコード化するのは、アドレス番号に含まれる“０”“１”なるデータの発生確率の変動を抑制するためである。即ち、ＦＭ変調の場合、“０”なるデータ領域と“１”なるデータ領域とでは搬送波の周波数が２１．０５ｋＨｚ，２３．０５ｋＨｚのように異なるため、“０”なるデータ領域と“１”なるデータ領域との発生確率が変動すると、１アドレス分を表現するための物理的な長さも変動してしまう。つまり、記録データの１ブロック毎の長さ（例えば、セクタ単位など）は一定であるのに、その場所を示すアドレス番号に含まれる“０”と“１”との発生確率に応じてアドレスを表現するためのウォブルの長さが変動してしまうことなり、矛盾を生じてしまう。よって、アドレス番号に含まれる“０”と“１”との発生確率をできるだけ一定にする必要があるため、アドレス情報をバイフェーズコードに一旦変換することにより、アドレス情報に含まれる“０”と“１”との発生確率の変動を抑制している。

【０００６】このようなウォブル信号によりウォブリン

グされた案内溝を有する光ディスク媒体を用いる光ディスク装置においては、案内溝が光ピックアップにより光学的に走査されるが、案内溝がトラッキングエラーとは多分に相違する周波数でウォブリングされているので、そのトラッキング信号はトラッキングエラー信号とＡＴＩＰ（Absolute Time In Pregroove）ウォブル信号とが重畳されたものとなる。

【０００７】そこで、光ディスク装置のアドレス復調回路１は、例えば、図４に示すように、バンドパスフィルタ２と周波数検波器３とにより構成されている。即ち、光ピックアップによって得られるトラッキング信号からバンドパスフィルタ２によってＡＴＩＰウォブル信号（ＦＭ変調信号）を抽出する。抽出されたこのＡＴＩＰウォブル信号を周波数検波器３により２２．０５ｋＨｚの閾値で２値化すればバイフェーズコードが復元される。そこで、このバイフェーズコードからバイフェーズ復号規則に従い、原のアドレス情報が復号される。

【０００８】

【発明が解決しようとする課題】ところが、このような従来の案内溝のウォブリング方法及びアドレス復調方式による場合、バイフェーズコード化及びバイフェーズコードからの復号処理が必要で、極めて複雑となっている。また、バイフェーズコード化処理を行っても必ずしも“０”“１”なるデータの発生確率の変動が皆無になる訳ではなく、アドレス領域の物理的な長さに変動を生じてしまうこともある。

【０００９】そこで、本発明は、極めて簡単にしてアドレス情報を案内溝に適正に重畳させることができ、さらにはそのアドレス情報の復元を簡単に行える光ディスク媒体及びそのアドレス復調回路を提供することを目的とする。

【００１０】

【課題を解決するための手段】請求項１記載の光ディスク媒体は、トラッキングのための案内溝がアドレス情報に対応して半径方向にウォブリングされている光ディスク媒体において、前記案内溝はアドレス情報の２値データ列“０”“１”のデータに応じてウォブリングされていない部分を含んでウォブリングされている。従って、ウォブリングされていない部分の含まれ方により、アドレス情報の２値データ列“０”“１”を区別して表現できるので、ＦＭ変調方式のように２つの異なる周波数でアドレス情報を表現する必要がなく、かつ、１ビットデータ領域の長さに違いを生ずることなく、極めて簡単かつ適正にアドレス情報の２値データ列をウォブリングにより案内溝に重畳させることができる。

【００１１】請求項２記載の発明は、請求項１記載の光ディスク媒体における案内溝のウォブリングは、cos波を搬送波として形成されている。従って、最も一般的なcos波表現による搬送波の下に、ウォブリングされた案内溝を途切れることなく連続して形成することができる。ここに、cos波表現はsin波表現としても実質的な違いはなく、等価である。

【００１２】請求項３記載の発明は、請求項２記載の光ディスク媒体におけるアドレス情報の２値データ列の各１ビットデータ領域は、cos波の整数倍周期単位の長さで形成されている。従って、ウォブリングされた案内溝におけるウォブル信号のデューティ比が常に一定となるため、ウォブル信号からのアドレス情報の復調処理が極めて簡単となる。併せて、このようなウォブル信号と同期をとるためのＰＬＬ回路に対しても複数のcos波成分が含まれており位相を比較する回数が増えるため、より同期をとりやすく、制御系も処理が容易となる。

【００１３】請求項４記載の発明は、請求項１，２又は３記載の光ディスク媒体において、アドレス情報の２値データ列“０”“１”の内の一方のデータ領域は全てウォブリングされ他方のデータ領域はウォブリングされていない部分を含んでウォブリングされている。従って、ウォブリングの有無によってアドレス情報の２値データ列“０”“１”を簡単に表現することができ、その復調も容易かつ正確に行えるものとなる。

【００１４】請求項５記載の発明は、請求項４記載の光ディスク媒体において、ウォブリングされていない部分の長さは、cos波の整数倍周期単位の長さである。従って、ウォブリングの有無によってアドレス情報の２値データ列“０”“１”を簡単に表現する際に、ウォブル信号のデューティ比が常に一定となるため、ウォブル信号からのアドレス情報の復調処理が極めて簡単となる。

【００１５】請求項６記載の発明は、請求項５記載の光ディスク媒体において、cos波の整数倍周期単位の長さは、cos波の１周期の長さである。従って、ウォブリングさせない領域の占める割合を必要最小限に抑えているので、ウォブリングされていない部分が含まれていても、ウォブル信号と同期をとるためのＰＬＬ回路等へ悪影響を及ぼすことはない。

【００１６】請求項７記載の発明は、請求項２，３，４，５又は６記載の光ディスク媒体において、搬送波の周波数は、トラッキングサーボ帯域の周波数とＲＦ再生信号帯域の周波数との間に設定されている。従って、案内溝をウォブリングさせる周波数がトラッキングサーボ系やＲＦ再生系に悪影響を及ぼすことはない。

【００１７】請求項８記載の発明のアドレス復調回路は、請求項１ないし７の何れか一記載の光ディスク媒体から得られるトラッキング信号に基づき案内溝のウォブル信号成分を抽出するバンドパスフィルタと、抽出されたウォブル信号成分の有無に応じてアドレス情報の２値データ列を復元する検波器とを備えている。従って、ウォブリングされていない部分の含まれ方を抽出してアドレス情報の２値データ列を復元すればよく、一旦バイフェーズコードを抽出してから変換処理を施して復元するような複雑な処理を要せず、簡単な回路構成で済む。

5

【００１８】

【発明の実施の形態】本発明の一実施の形態を図１及び図２に基づいて説明する。本実施の形態では、光ディスク媒体自体は特に図示しないが、ＣＤ－Ｒ，ＣＤ－ＲＷ，ＤＶＤ等の各種追記型又は書換え型の光ディスク媒体であって、トラッキングのためにディスクに刻まれる案内溝（グルーブ）が予めアドレス情報に対応して半径方向にウォブリングされるものに適用される。ここに、本実施の形態では、特に、アドレス情報に対応させた案内溝のウォブリングのさせ方に特長を有する。即ち、本実施の形態ではディスクに刻まれる案内溝を、ディスク半径方向に蛇行させてウォブル溝として形成し、そのウォブル溝にアドレス情報を重畳させる際に、常にウォブリングさせることなく、アドレス情報の２値データ列“０”“１”のデータに応じて部分的にウォブリングされていない部分を含ませることで、異なるデータを表現している。

【００１９】まず、案内溝をウォブリングさせる際の搬送波としては cos波が用いられ、基本的に、ウォブリングされた案内溝が途切れることなく連続するように設定されている。ここに、アドレス情報の２値データ列“０”“１”の各１ビットデータ領域は、図１に示すように、 cos波の１周期分の整数倍周期単位、ここでは４周期分単位の長さに設定されている。このような設定により、ウォブル信号のデューティ比が常に一定となり、直流成分変動の影響を受けないため、後述するアドレス情報の復調回路を容易な構成で実現できることになる。同時に、特に図示しないが、ウォブル信号と同期をとるためのＰＬＬ回路にとっては、ある程度ウォブルの波（ cos波）の数が多い方が位相比較の回数が増えて同期をとりやすくなる。

【００２０】そして、実際のウォブリングについては、図１にアドレス情報の２値データ列とウォブル構成とを対比して示すように、アドレス情報の２値データ列“０”“１”の内の一方のデータ“０”の領域では案内溝を常にディスク半径方向にウォブリングさせたウォブル溝として形成され、他方のデータ“１”の領域では cos波の１周期分の整数倍周期、ここでは、１周期分をウォブリングさせない部分Ａとして含み残りの部分でディスク半径方向にウォブリングさせたウォブル溝として形成されている。従って、本実施の形態の場合、データ“０”の領域では cos波の４周期分がウォブリングされた案内溝として形成され、データ“１”の領域では先頭の cos波の１周期分だけウォブリングされていない部分を有しその後にcos波の３周期分がウォブリングされた案内溝として形成されている。ここに、本実施の形態では、ウォブリングさせない部分を cos波の１周期分として一定にしているため、ウォブル信号のデュティ比に変更をもたらすことがなく、アドレス情報の復調回路系に影響を及ぼさない。また、例えばウォブリングさせない部分を cos波の２周期分としてもよいわけであるが、本実施の形態では、最小限である cos波の１周期分としているので、ウォブル信号と同期をとるためのＰＬＬ回路において同期をとれない部分が最小となるので、同期のとりやすさも維持できる。

6

【００２１】図２に本実施の形態において上記のような光ディスク媒体を用いる光ディスク装置中に設けられるアドレス情報の復調回路４の構成例を示す。この復調回路４はバンドパスフイルタ５と検波器６とにより構成されている。光ディスク媒体から得られるトラッキング信号はバンドパスフィルタ５に入力されて cos波に対応するウォブル信号成分が抽出される。抽出されたウォブル信号成分は検波器６に入力されてそのウォブル信号の有無が検出され、その有無に応じてアドレス情報の２値データ列が復元されることになる。例えば、本実施の形態の場合であれば、 cos波の４周期分の領域から cos波の４周期分のウォブル信号が検出されればアドレス情報の２値データ列“０”“１”中のデータ“０”の領域であると認識され、 cos波の４周期分の領域から cos波の３周期分のウォブル信号が検出されればデータ“１”の領域であると認識される。即ち、ウォブリングされていない部分の含まれ方により、アドレス情報の２値データ列“０”“１”の何れの領域であるかを明確に区別することができ、アドレス情報の復調が容易かつ正確となる。

【００２２】ここに、この光ディスク装置中には、当然、トラキングサーボ系やＲＦ再生系が含まれるが、これらのトラッキングサーボ帯域の周波数とＲＦ再生信号帯域の周波数との関係では、光ディスク媒体の案内溝をウォブリングさせるための搬送波としての cos波の周波数は、トラッキングサーボ帯域の周波数とＲＦ再生信号帯域の周波数との間の空いている周波数に設定されている。よって、案内溝をウォブリングさせる周波数がトラッキングサーボ系やＲＦ再生系に悪影響を及ぼすことはない。

【００２３】なお、本実施の形態では、データ“１”の領域の先頭部分にウォブリングさせない部分を割り当てているが、データ“１”の領域内であれば先頭部分でなくてもよい。

【００２４】また、本実施の形態では、データ“０”の領域側では全てウォブリングさせデータ“１”の領域側にウォブリングさせない部分を含ませているが、逆に、データ“１”の領域側では全てウォブリングさせデータ“０”の領域側にウォブリングさせない部分を含ませてウォブリングさせるようにしてもよい。要は、当該光ディスク媒体の規格として何れか一方に予め設定して統一しておけばよい。

【００２５】

【発明の効果】請求項１記載の発明の光ディスク媒体によれば、トラッキングのための案内溝がアドレス情報に対応して半径方向にウォブリングされている光ディスク

媒体において、案内溝はアドレス情報の２値データ列“０”“１”のデータに応じてウォブリングされていない部分を含んでウォブリングされているので、ウォブリングされていない部分の含まれ方により、アドレス情報の２値データ列“０”“１”を区別して表現することができ、ＦＭ変調方式のように２つの異なる周波数でアドレス情報を表現する必要がなく、かつ、１ビットデータ領域の長さに違いを生ずることなく、極めて簡単かつ適正にアドレス情報の２値データ列をウォブリングにより案内溝に重畳させることができる。

【００２６】請求項２記載の発明によれば、請求項１記載の光ディスク媒体における案内溝のウォブリングが、cos波を搬送波として形成されているので、最も一般的な cos波表現による搬送波の下に、ウォブリングされた案内溝を途切れることなく連続して形成することができる。

【００２７】請求項３記載の発明によれば、請求項２記載の光ディスク媒体におけるアドレス情報の２値データ列の各１ビットデータ領域が、 cos波の整数倍周期単位の長さで形成されているので、ウォブリングされた案内溝におけるウォブル信号のデューティ比を常に一定にすることができ、ウォブル信号からのアドレス情報の復調処理を極めて簡単なものとすることができ、併せて、このようなウォブル信号と同期をとるためのＰＬＬ回路に対しても複数の cos波成分を含ませることで位相を比較する回数が増えるため、より同期をとりやすくすることもできる。

【００２８】請求項４記載の発明によれば、請求項１，２又は３記載の光ディスク媒体において、アドレス情報の２値データ列“０”“１”の内の一方のデータ領域は全てウォブリングされ他方のデータ領域はウォブリングされていない部分を含んでウォブリングされているので、ウォブリングの有無によってアドレス情報の２値データ列“０”“１”を簡単に表現することができ、その復調も容易かつ正確に行うことができる。

【００２９】請求項５記載の発明によれば、請求項４記載の光ディスク媒体において、ウォブリングされていない部分の長さが、 cos波の整数倍周期単位の長さとされているので、ウォブリングの有無によってアドレス情報

の２値データ列“０”“１”を簡単に表現する際にも、ウォブル信号のデューティ比を常に一定に維持することができ、ウォブル信号からのアドレス情報の復調処理を極めて簡単なものとすることができる。

【００３０】請求項６記載の発明によれば、請求項５記載の光ディスク媒体において、 cos波の整数倍周期単位の長さが、 cos波の１周期の長さとされ、ウォブリングさせない領域の占める割合を必要最小限に抑えているので、ウォブリングされていない部分が含まれていても、ウォブル信号と同期をとるためのＰＬＬ回路等への悪影響を回避することができる。

【００３１】請求項７記載の発明によれば、請求項２，３，４，５又は６記載の光ディスク媒体において、搬送波の周波数が、トラッキングサーボ帯域の周波数とＲＦ再生信号帯域の周波数との間に設定されているので、案内溝をウォブリングさせる周波数がトラッキングサーボ系やＲＦ再生系に悪影響を及ぼすことを回避できる。

【００３２】請求項８記載の発明のアドレス復調回路によれば、請求項１ないし７の何れか一記載の光ディスク媒体から得られるトラッキング信号に基づき案内溝のウォブル信号成分を抽出するバンドパスフィルタと、抽出されたウォブル信号成分の有無に応じてアドレス情報の２値データ列を復元する検波器とを備えているので、ウォブリングされていない部分の含まれ方を抽出してアドレス情報の２値データ列を復元すればよく、一旦バイフェーズコードを抽出してから変換処理を施して復元するような複雑な処理を要せず、簡単な回路構成で済ませることができる。

【図面の簡単な説明】

【図１】本発明の一実施の形態のアドレス情報の２値データ列とウォブル構成との関係を示す説明図である。

【図２】アドレス情報の復調回路を示すブロック図である。

【図３】従来のＦＭ変調方式を示す説明図である。

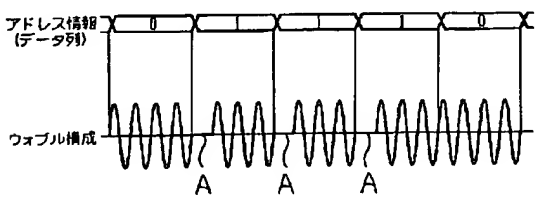
【図４】アドレス情報の復調回路を示すブロック図である。

【符号の説明】

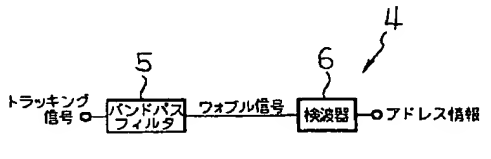
5　　バンドパスフィルタ

6　　検波器

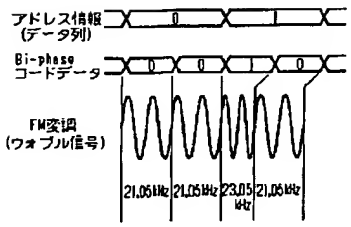
【図１】



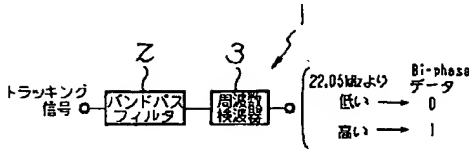
【図２】



【図３】


アドレス情報
(データ列)
Bi-phase
コードデータ
FM変調
(ウォブル信号)
0
0
0
1
0
21.05kHz
21.05kHz
23.05kHz
21.05kHz

【図４】


1
2
3
トラッキング
信号
バンドパス
フィルタ
周波数
検波器
22.05kHzより
低い
高い
Bi-phase
データ
0
1